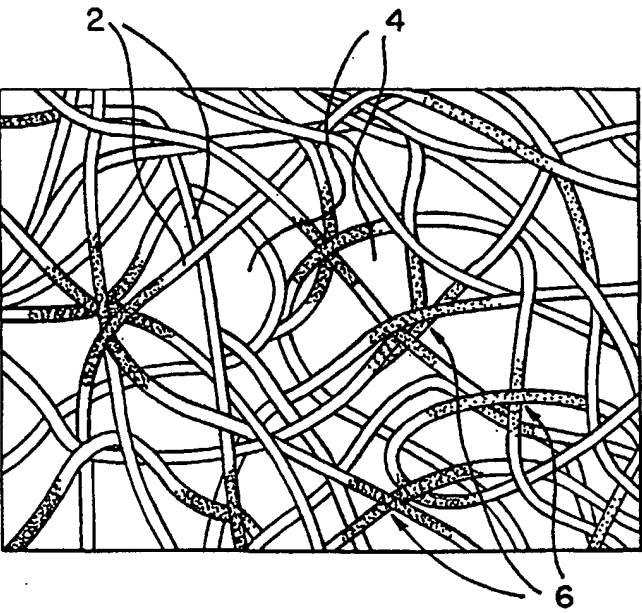


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(21) International Application Number: PCT/US00/06208 (22) International Filing Date: 8 March 2000 (08.03.00) (30) Priority Data: 60/123,454 9 March 1999 (09.03.99) US (71) Applicant: BBA NONWOVENS SIMPSONVILLE, INC. [-/US]; 840 Southeast Main Street, Simpsonville, SC 29681 (US). (72) Inventors: KINN, Larry, L.; 63 Jefferson Road, Franklin, MA 02038 (US). ANGELINI, Peter; 96 King Street, Norfolk, MA 02056 (US). (74) Agent: BARICEVAC, Donald; Ostrager Chong & Flaherty, P.C., 825 Third Avenue, 30th Floor, New York, NY 10022-7519 (US).			(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published With international search report.
(54) Title: ENHANCED PARTICLE CAPTURING NONWOVEN			
(57) Abstract <p>A nonwoven with enhanced dust, dirt and particle capturing abilities is preferably made from a carded web which is thermally calendered and padded with a pressure sensitive adhesive (6).</p>			
			

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ENHANCED PARTICLE CAPTURING NONWOVEN

This application claims priority from the earlier
filed U.S. Provisional Application Serial No. 60/123,454,
filed March 09, 1999, which is incorporated herein by
5 reference.

FIELD OF THE INVENTION

The invention generally relates to cleaning and tack
cloths, and more particularly to nonwoven fabrics
10 containing adhesives which are effective to remove dust,
dirt or other particles from a wide variety of surfaces.

BACKGROUND OF THE INVENTION

Cleaning cloths of natural and synthetic fibers have
15 been in use for many years. Nonwoven cloths are
particularly useful as cleaning cloths. In particular,
nonwoven cloths made by the hydroentanglement process
(HEP) are highly effective for this use. The HEP is
well-described in U.S. Pat. No. 3,537,945. Essentially,
20 HEP involves treating a web of fibers with jets of high
pressure water or other liquid which serves to "entangle"
the fibers, i.e., to force the fibers from a position of
alignment into one where the fibers individually are at
various angles with respect to each other and become
25 physically entangled to produce a hydroentangled fabric

(HEF). The HEF is strong and soft, and it contains voids which occur between the physical junctions of the fibers which are effective in assisting the pick-up and retention of dust and particles. Moreover, the HEF can
5 be adjusted to produce a HEF which has visible apertures which also enhance dust and particle pick-up and retention. Examples of patents which relate to HEF and cleaning cloths generally are U.S. Patents 4,925,722; 4,959,894; 5,142,752; 5,198,292 and 5,198,293, which are
10 hereby incorporated by reference.

In addition, it is known that various other types of nonwoven cleaning cloths can be used and that they may be bonded by various materials, including latex, to increase
15 the cloths ability to adhere dirt. However, these cloths may be stiff and difficult to use because of the large amount of binder used and/or because a large portion, or all, of the surface of the cloth is covered with a binder or adhesive. Further, tackifiers, which increase the
20 cloths ability to adhere to dirt, may be employed, but often cause smearing when the cloth is used on a shiny surface. To reduce this problem, lubricants or slipping agents can be added to the cloth. However, these lubricants are left behind on the surface being cleaned
25 and, consequently, some smearing will still occur.

Other cleaning cloths rely on electrostatic charges in order to attract and hold dust, dirt and debris. However, these cloths must be made with fibers and/or binders with particular electrical properties and/or charges in order to function effectively.

Therefore, nonwoven webs made by various forming technologies may offer many of the properties consistent with the requirements for disposable dusting cloths, including softness, strength and cost effectiveness. However, it was found that the art could be improved by increasing the dirt holding capability of nonwoven cloths while maintaining the softness of the cloth and without using tackifiers and/or lubricants, particularly as applied to cloths used for hand dusting and dust mop applications.

The present invention employs a carded fiber web instead of a HEF which is preferably, but not necessarily, made of synthetic fibers. In particular, polyolefinic or other similar fibers are appropriate. The carded thermally calendered/bonded web has many of the advantages of HEF because the final nonwoven product

is bonded in such a way that a web with a soft, bulky, three dimensional texture results.

In addition, the nonwoven is padded with a relatively small amount of pressure sensitive adhesive so that a cleaning cloth results that is exceptionally well-suited for adhering to and retaining dust, dirt and other particles and, consequently, is useful for a multitude of cleaning tasks. The invention does not require the inclusion of mineral oil or other fugitive tackifiers that can be released during normal use.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a nonwoven cleaning cloth comprising at least one carded, thermally calendered fiber layer, wherein said cloth is coated with discrete, discontinuous regions of pressure sensitive adhesive.

Another object of the invention is to provide a cleaning cloth where the pressure sensitive adhesive is latex. The latex may be a tacky latex with a high sheer strength. In particular, the latex may be a low solids vinyl acrylic copolymer adhesive latex.

A further object of the invention is to provide a cleaning cloth where latex may be added to the cloth at an amount which is approximately 3.5%-4.6% of the weight of the cloth before coating.

5

Another object of the invention is to provide a cleaning cloth where the fibers of the nonwoven cloth need not be bonded by said pressure sensitive adhesive, and the fibers may be polypropylene or similar fibers.

10

A further object of the invention is to provide a cleaning cloth which may be comprised of multiple fiber layers.

15

Another object of the invention is to provide a cleaning cloth which is characterized in that the cloth does not leave any significant residue behind on a surface being cleaned or polished by the cloth.

20

A further object of the invention is to provide a cleaning cloth which has a soft handle and a high affinity for dust, dirt and other particles.

Another object of the invention is to provide a
25 cleaning cloth which is thermally calendered so that a

nonwoven web with a discontinuous bond with discrete depth and area results. The cloth may be relatively soft and bulky and contain closed voids or cells.

5 A further object of the invention is to provide a nonwoven cleaning cloth wherein said cloth further comprises at least one, separately manufactured, nonwoven fiber layer.

10 Another object of the invention is to provide a nonwoven cleaning cloth wherein said cloth is cut into a particular shape or is visibly marked to assist the end user with the proper use of the cloth.

15 Finally, it is a further object of the invention to provide a method for producing the nonwoven cleaning cloth, including the process of carding a web of staple fibers, thermal calendering the web and applying pressure sensitive adhesive to the web. This process may include
20 saturating the cloth in a low solids mixture of water and pressure sensitive adhesive.

Other objects, features and advantages of the present invention will be apparent when the detailed
25 description of the preferred embodiments of the invention

are considered in conjunction with the drawing which should be construed in an illustrative and not limiting sense as follows:

5 BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a color photomicrograph showing a preferred embodiment of the invention.

FIG. 2 is an illustrative schematic showing an
10 example of a processing line which may be used for thermal bonding of a nonwoven web in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 FIG. 1 is a photomicrograph showing an enlarged view of the fibers 2 and voids 4 of a preferred embodiment of the invention. This Figure also shows the discrete, discontinuous regions of latex 6 (blue areas) on the web.

20 The general processes of carding, thermal calendering and padding webs are known within the art. U.S. Patent No. 5,851,935, incorporated herein by reference, gives background information concerning the carding and calendering process.

25

One example of a carding and calendering process is shown in FIG. 2. Carded webs 4 and 6, are respectively formed by conventional carding devices 16A and 16B. Each carding device is associated with a respective hopper 5 18A, 18B with a chute feed for feeding a dense mat of fibers to the inlet of the carding device. Each carding device consists of an assembly of rotating cylinders and rollers covered with a sawtooth-type metallic wire. There are two main actions that take place in each carding 10 device: carding and stripping. The "carding" action that occurs between the rollers is the combing of fibers between two metallic clothed surfaces that have opposing points. It is a mechanical action in which fibers are held by one surface while another surface combs them, 15 rendering the fibers parallel to one another. The "stripping" action occurs when the fibers are transferred from one roll to another with metallic wire points in the same direction. A speed differential between the two rollers allows fiber transfer. As shown schematically in 20 FIG. 2, a series of smaller rollers are spaced along the top of the main cylinders 15A, 15B. For the sake of simplicity, FIG. 2 shows a single roller at each station. However, it is understood by persons skilled in the art that each station in fact comprises a worker roller and a 25 stripper roller working in tandem. The fiber tufts are

worked on by the worker roller and then transferred to the stripper roller. The stripper puts the fibers back onto the main cylinder ahead of the carding plane, which allows the fibers to be worked on repetitively until the
5 fiber tufts are reduced to single fibers. This process continues throughout the top of the main cylinder, which accounts for the web being 20-50 times less dense than the feed mat. The fibers then travel to the doffers 17A, 17B, which are moving slower than the main cylinder and
10 in the same direction. Further carding occurs at this junction. After making half a turn on the doffer, the fibers come up under a comb (not shown). The function of the comb is to remove the fibers from the doffer with as little disturbance as possible. The action of the comb is
15 strictly stripping and the web of fibers is gently deposited onto a moving card conveyor 20. The main purposes of the carding devices are: (1) to open the fiber flock; (2) if necessary, to clean the fibers of extraneous matter like dirt and shorter fibers; (3) to
20 make the fibers straight and orient the single fibers parallel to each other; and (4) to convert the single fibers into a continuous uniform web in which fibers are held together by their own adhesion.

As seen in FIG. 2, the carding device 16A forms a carded web 6; the carding device 16B forms a carded web 4. First, the carded web 6 is laid on top of the moving card conveyor 20; then the carded web 4 is laid on top of the carded web 6. The webs 4, 6 of fibers are fed into the nip between heated calendar rolls 8 and 10 via card conveyor 20, a plurality of idler rolls 22 and an inclined conveyor 24. In accordance with the preferred method of manufacture, the top calendar roll 8 is smooth and the bottom calendar roll 10 is engraved. Depending on the materials used, the temperature of the top and bottom rolls may be in the range of 200.degree.-450.degree. F. For polypropylene staple fibers, the calendar roll temperature should be in the range of 290-320 degree F.

15 The pressure between the top and bottom rolls may be in the range of 100-600 pli. However, it is preferred that the pressure between the top and bottom calendar rolls be about 250 pli. The line speed may be in the range of 50-600 fpm. Samples were manufactured at a line speed of 100

20 fpm.

The laminate bond pattern on the engraved top roll 8 can have any one of a number of different geometries. The total bonding area can be varied in the range of 5-30%.

25 In accordance with the preferred embodiment, the engraved

top calendar roll 8 has a repeating 7-point dot pattern of spaced circular lands 12 which form the bond spots. Referring again to FIG. 2, after being laminated by the calendar rolls 8 and 10, the web passes through a pair of
5 opposing rolls 26 which control in-wound stretch of the web. The web is optionally spread by a spreader roll to remove wrinkles. Then the web is wound by a pair of surface winder rolls 28, both of which are driven. The surface winder has slitting capability. The final product
10 is a wound roll 30 of soft nonwoven cloth.

The invention enhances the dirt holding ability of a nonwoven web with minimal or no change to the feel of the cloth by adding a discrete amount of adhesive latex.
15 This feel is further defined as soft handle. Fugitive or migratory additives are not needed.

The invention results in the creation of a three dimensional texture by using a bonding mechanism,
20 specifically, a calendering operation, that yields a discontinuous bond with discrete depth and area. This technique maintains bulk and softness and creates voids or cells in the fabric because a relatively small percentage of the web area (relatively small percentage
25 of fibers) melts and becomes bonded - but not much open

area is created. The cells or depressions in the nonwoven caused by the calendering process may be closed in that they are depressions but not holes through the wipe. It was found that the best performing base fabrics were patterned or, more specifically, cell containing. It was also discovered that closed cells provided at least two possible advantages over open cells or apertures: (1) both sides of the cloth could be used for cleaning, or (2) if the user preferred to not come into contact with the dirt one side of the closed cell cloth could be used and the cloth itself would create a barrier so the user's hand would remain clean.

The pressure sensitive adhesive used has a very high attraction for itself and, therefore, will not separate from the nonwoven during use and will leave a clean, unsmear surface behind. The cloth is tacky enough to pick up particles but will not stick to surfaces. Therefore, there is no need to add a tackifier or a lubricant.

The invention is very effective in picking up dust, dirt and other particles and retaining them. Since the surface being cleaned does not smear, the cloth can be used on surfaces that include glass or other shiny

surfaces. The user, therefore, can clean and polish a surface with the same cloth.

The pressure sensitive adhesive does not bind the
5 fibers of the nonwoven to each other but, instead, is
added to at least one outer surface of the nonwoven so
that discrete, discontinuous regions of are formed on the
fibers in the web. This allows the use of a relatively
small amount of pressure sensitive adhesive which
10 translates to lower production costs and a final product
that is easy to use because of its soft handle
characteristics.

The invention is not limited to fibers, pressure
15 sensitive adhesives, processing parameters, storage
parameters, use parameters or other parameters that may
affect electrostatic/electrical charges because the cloth
attracts and holds dust, dirt and other particles because
of its soft bulky characteristics and the tackiness of
20 the pressure sensitive adhesive.

The following fibers can be used alone or in blends:
polypropylene, rayon and polyethylene. For example, HY
COMFORT is a fiber manufactured by Fiber Visions, in
25 Wilmington, Delaware. It is preferred that the cloth

contain at least some polyolefin to assist in the thermal bonding of the web.

The nonwoven web is thermally calendered prior to the addition of the pressure sensitive adhesive so that it is soft, bulky and has discontinuous bonds with discrete depth and area. Generally, though not necessarily, more than one web layer is used and the layers become bonded to one another during the thermal calendering process. One or more additional nonwoven layers, which may be manufactured separately, can also be incorporated into the cloth. These layers may be carded, wet laid, spun bonded, hydroentangled or other types of nonwovens.

15

The application of pressure sensitive adhesive can be accomplished in ways that include but are not limited to gravure, spray, or screen coaters or pad bath.

For certain uses, such as the attachment of the cloth to the end of a mop, broom or similar device, the cloth may be cut into a roughly square or rectangular shape to facilitate its attachment to the device. In this situation it may be advantageous to cut the rectangle from the cloth so that the short direction of

25

the cloth corresponds to the machine direction during the manufacturing process. The long direction of the cloth would, therefore, correspond to the cross direction of the cloth during the manufacturing process. This may add
5 to the usefulness of the cloth which, in this situation, would be stressed more in the machine direction, which is generally the stronger direction, during use. Use of specific shapes to fit a mop or broom as described here could add to the products value by helping a user to use
10 the cloth effectively.

The following examples of preferred embodiments should not be construed to limit the invention.

15 EXAMPLES

These examples concern a carded, dry laid, nonwoven web of polypropylene staple fiber that has been thermally bonded through a heated calendering process. The calender pattern is a 7 point dot with 111.5 points per
20 inch, and each point is 0.045" wide. The engraved depth is 0.032.

The nonwoven web is then padded with a very low solids vinyl acrylic copolymer adhesive latex that has
25 been shown to improve the dirt pickup and holding ability

of the cloth. There appears to be an increase in the coefficient of friction to the web but this has not been quantified. The latex is added at a deliberate rate of about 3.5%-4.6% of the web weight to result in discrete, discontinuous regions of well adhered latex on the fibers of the web. The finished rolls of nonwoven are converted into sheets with the strongest direction, in this example the machine direction, of the sheet corresponding to the mopping direction.

10

The following tables include tests results and examples of materials which may be used in the preferred embodiments:

15 Table 1 describes one example of a pressure sensitive adhesive which may be used in the invention.

Table 2 illustrates the percentage of adhesive added to three sample products.

20

Table 3 illustrates the results of tests conducted with the sample products.

(1) The Dirt Pickup Test shows the ability of the cloth of the invention to pickup and retain more particles.

25

(2) The Rub-Off Test demonstrates that the cloth of the invention may be used to clean and polish shiny surfaces and will not smudge or leave residue behind.

(3) The Summary of Results highlights the
5 invention's improvement over the control cloths in the
Dirt Pickup Test.

Table 4 illustrates examples of base grade specifications
for nonwovens which may be used in the invention.

10

Table 5 illustrates one example of a treatment mixture.

Table 6 illustrates one example of product specifications
for a cloth.

15

COVINAX 114-00 (Franklin International, Columbus, Ohio)
5 Surfactant stabilized vinyl acrylic copolymer emulsion, extremely high shear
with moderate peel and tack. (Low glass transition temperature, moderate
tack for dust holding. High shear for non-smudging or zero rub off.)
Polymer type: Vinyl acrylic
Protective system: Anionic
10 Viscosity (cps): 1,000-1,500 RVF Spindle #3/60 RPM/77°F
Percent solids: 52%-55%
pH: 4.0-5.0
Freeze/thaw stability: unstable
Weight per gallon: 8.66
Borax compatible: Yes
15 Color: White

Performance properties:

20 A 1 mil (28g/M²) dry film of COVINAX 114-00 cast directly onto 1 mil
thickness polyester film will exhibit the following average performance
properties when tested on #304 stainless steel, which has a #3 surface
finish.

	<u>Test</u>	<u>Performance Values</u>
25	180° Peel adhesion	1.5 pounds
	PSTC-1, 30 minute dwell	
	178° Shear adhesion	5,000+ minutes
	0.25 square inch,	
	500 gram load, 10 minute dwell	
	Loop tack	0.9 pounds
30	1 sq. in. contact,	
	1 second dwell	
	Rolling Ball tack	10+ inches
	PSTC-6	
35	Coating weight	1.0 dry mil

Glass transition temp. (Tg): -24°C

Sample No.	Weight (gms)	Weight after padding (gms)	Percent add-on
1	4.06	4.23	4.2
2	4.08	4.24	3.9
3	4.12	4.31	4.6

5

Padded with the longer side (CD side) into pad roll. Dried at 270°F 6 min. (smooth side up).

DIRT PICKUP TEST

5 (Cloth used on approximately 20 foot strip of warehouse floor.)

Untreated Control

Sample No.	Cloth weight (gms)	Cloth weight after dirt pickup (gms) (static results)	Particle weight (gms)	Weight after shaking (shaken 3 times) (gms) (dynamic results)	Difference in weight of sample before dirt pickup and after dirt pickup and shaking
Utc 1	4.1070	5.1779	1.0709	4.2845	0.1775
Utc 2	4.0495	4.9527	0.9032	4.6686	0.6191
Utc 3	4.1013	5.2449	1.1436	4.7716	0.6703

10 100% polypropylene, thermal bond.

Sample Products

Sample No.	Cloth weight (gms)	Cloth weight after dirt pickup (gms) (static results)	Particle weight (gms)	Weight after shaking (shaken 3 times) (gms) (dynamic results)	Difference in weight of sample before dirt pickup and after dirt pickup and shaking
1	4.2438	5.2093	0.9655	4.9871	0.7433
2	4.2571	5.4419	1.1848	5.2625	1.0054
3	4.3120	5.4353	1.1233	5.1815	0.8695

15 100% polypropylene, thermal bond.

RUB-OFF TEST

20 Samples 1, 2 and 3 were further tested in a "rub-off" experiment on a mirror. Under normal pressure (hand pressure) the samples left zero residue on the surface being cleaned. Under extreme pressure (edge of a ruler pressing a section of the cloth onto the mirror surface) the samples left a very slight residue.

25

SUMMARY OF RESULTSUntreated Control

30 1.0392 grams average dirt pickup - static results.

0.6556 grams average dirt pickup - dynamic results.

35

Samples 1, 2 and 3 (combined results)

1.0912 grams average dirt pickup - static results
(5% enhancement compared to control)

40

0.8727 grams average dirt pickup - dynamic results
(33% enhancement compared to control)

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5 grade: 9159815
1999 development grade: 9159815
start roll no.: 5905801
reference trial grade: 9359999
basis weight: 59.0 GSY
product description: 59.0 GSY PP 7-Bond, 7 pt.
target line speed: 200

10

number of webs	4
target GSY	14.75 x 4
%/type	100% HY comfort PP

15 grade: 9159815
roll no.: 5905801

process speeds - FPM	hand tac
under card conveyor	226
incline conveyor	224
E-roll	222
M-roll	226
cooling roll	215
dancer roll	234
wind-up	237

calender temperatures	set point	surface
E-roll temp deg F	342	314-316
M-roll temp deg F	328	305-306

calender pressures	front
M-roll pressure	510
nip PLI	600

20 grade: 9159815
1999 development grade:
roll no.: 5905803

process speeds - FPM	hand tac
under card conveyor	185
incline conveyor	186
E-roll	182
M-roll	186
cooling roll	176
dancer roll	193
wind-up	190

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Water:	464 gal.
COVINAX 114-00:	91.74 lbs.
Rinse Water:	25 gal.
Solids:	1.34%
lbs./gal.:	8.34
lbs. solids/gal.:	0.112

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GRADE	UNITS
weight	62 g/y ²
thickness	28 mils
air permeability	235 cfm
MD (machine direction) tensile	7,240 g/in
CD (cross direction) tensile	850 g/in
MD elongation	65%
CD elongation	195%

5

reference to preferred embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. Examples include: (1) a variety of fibers, fiber combinations and pressure sensitive adhesives, including various types of latex, may be utilized, (2) expandable latex or printed adhesive latex may be useful, (3) textured finishes may be imparted to the wipes with conventional differential shrinkage techniques, and (4) carded nonwoven webs made of several plies with a stabilizing ply of another carded web or other nonwoven may perform adequately after treatment with a pressure sensitive adhesive. In addition, many modifications may be made to adapt a particular situation to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

1. A nonwoven cleaning cloth comprising at least one
carded, thermally calendered fiber layer, wherein said
5 cloth is coated with discrete regions of pressure
sensitive adhesive.

2. The nonwoven cleaning cloth of claim 1, wherein said
pressure sensitive adhesive is latex.

10

3. The nonwoven cleaning cloth of claim 2, wherein said
latex is tacky and has a high sheer strength.

4. The nonwoven cleaning cloth of claim 2, wherein said
15 latex is a low solids vinyl acrylic copolymer adhesive
latex.

5. The nonwoven cleaning cloth of claim 2, wherein said
latex is added to said cloth at an amount which is
20 approximately 3.5% - 4.6% of a weight of said cloth
before coating.

6. The nonwoven cleaning cloth of claim 1, wherein said
fiber layer is not bonded by said pressure sensitive
25 adhesive.

7. The nonwoven cleaning cloth of claim 1, wherein said fiber layer is comprised of polypropylene.
- 5 8. The nonwoven cleaning cloth of claim 1, wherein said cloth comprises four fiber layers.
9. The nonwoven cleaning cloth of claim 1, wherein said cloth does not leave a residue behind on a surface being
10 cleaned or polished by said cloth.
10. The nonwoven cleaning cloth of claim 1, wherein said cloth has a soft handle.
- 15 11. The nonwoven cleaning cloth of claim 1, wherein said cloth has a high affinity for dust, dirt and other particles.
12. The nonwoven cleaning cloth of claim 1, wherein said
20 thermal calendering yields a discontinuous bond with discrete depth and area.
13. The nonwoven cleaning cloth of claim 1, wherein said cloth is relatively soft and bulky and contains closed
25 voids or cells.

14. The nonwoven cleaning cloth of claim 1, wherein said cloth further comprises at least one, separately manufactured, nonwoven fiber layer.

5

15. The nonwoven cleaning cloth of claim 1, wherein said cloth is cut into a roughly rectangular shape, said shape having a long direction and a short direction, said long direction corresponding to a cross direction of said cloth and said short direction corresponding to a machine direction of said cloth.

16. A nonwoven cleaning cloth comprising four carded, thermally calendered polypropylene layers, wherein said cloth is coated with an adhesive latex so that discrete regions of said latex are formed thereon.

17. A method for producing a nonwoven cleaning cloth which comprises the steps of:

- 20 (a) carding a web of staple fibers;
- (b) thermal calendering said web; and
- (c) applying a pressure sensitive adhesive to said web so that discrete regions of said adhesive are formed thereon.

25

sensitive adhesive is latex.

19. The method of claim 18, wherein said latex is tacky
5 and has a high sheer strength.

20. The method of claim 18, wherein said latex is a low
solids vinyl acrylic copolymer adhesive latex.

10 21. The method of claim 17, wherein said padding step
adds to said cloth an amount of pressure sensitive
adhesive which is approximately equal to 3.5%-4.6% of a
weight of said cloth before padding.

15 22. The method of claim 17, wherein said fiber layer is
not bonded by said pressure sensitive adhesive.

23. The method of claim 17, wherein said staple fibers
are comprised of polypropylene.

20

24. The method of claim 17, wherein said web is comprised
of four fiber layers.

leave a residue behind on a surface being cleaned or polished by said cloth.

5 26. The method of claim 17, wherein said cloth has a soft handle.

27. The method of claim 17, wherein said cloth has a high affinity for dust, dirt and other particles.

10

28. The method of claim 17, wherein said thermal calendering yields a discontinuous bond with discrete depth and area.

15 29. The method of claim 17, wherein said cloth is relatively soft and bulky and contains closed voids or cells.

30. The method of claim 17, wherein said applying step
20 comprises saturating said cloth in a low solids mixture comprising at least water and a pressure sensitive adhesive.

A nonwoven with enhanced dust, dirt and particle capturing abilities is preferably made from a carded web which is thermally calendered and padded with a pressure
5 sensitive adhesive.

1/2

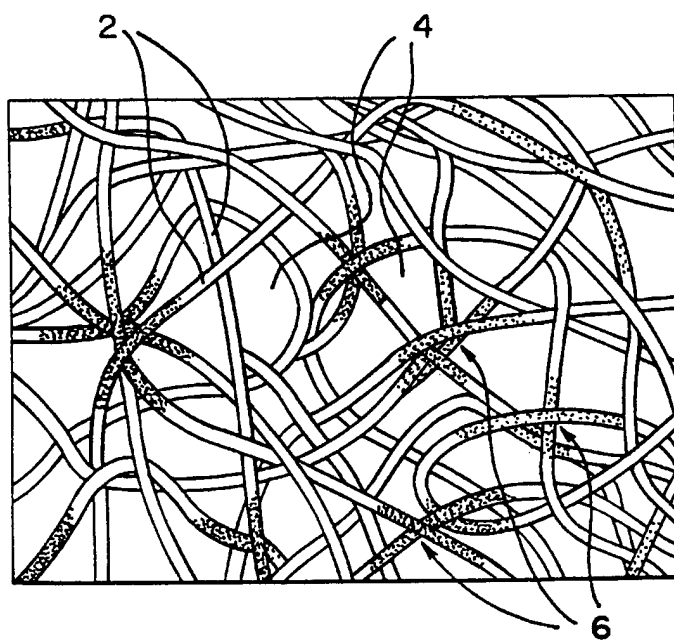


FIG. 1

2/2

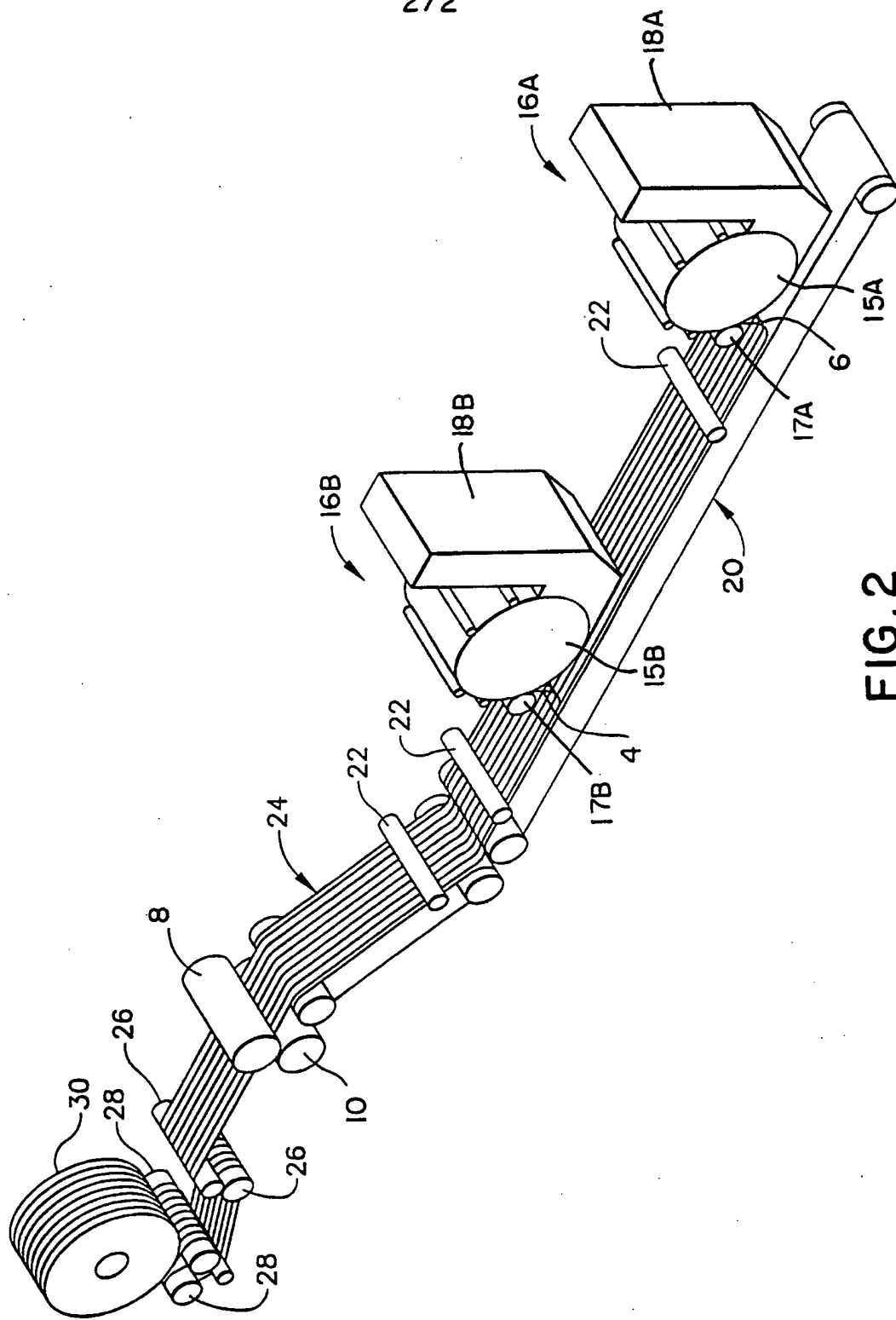


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06208

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B32B 27/04, 27/30; D04H 1/56

US CL :442/151, 401, 408

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 442/151, 401, 408

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,198,292 A (LERNER et al) 30 March 1993, see entire document.	1-30
X	US 5,198,293 A (METRICK) 30 March 1993, see entire document.	1-30



Further documents are listed in the continuation of Box C.



See patent family annex.

*

Special categories of cited documents:

A

document defining the general state of the art which is not considered to be of particular relevance

E

earlier document published on or after the international filing date

L

document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O

document referring to an oral disclosure, use, exhibition or other means

P

document published prior to the international filing date but later than the priority date claimed

T

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

A

document member of the same patent family

Date of the actual completion of the international search

22 MAY 2000

Date of mailing of the international search report

20 JUN 2000

Name and mailing address of the ISA/US
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/06208

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

WEST 2.0

search terms: carding, calendering, latex, polypropylene, composite, laminate, web, sheet, cloth, wipe, nonwoven, vinyl acrylic